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ABSTRACT

This module is one of five modules on length, area, volume and capacity, mass, and temperature, developed for the use of teachers and teacher-trainer team leaders. Primary and intermediate activities in this booklet concentrate on the concept of mass with emphasis on metric measurement. The objectives and needed materials for each activity are listed. (MN)

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PROJECT:

"METRIC EDUCATION: WE ARE GETTING READY FOR THE CHANGE"

MODULE ON MASS

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1977

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INTRODUCTION

This module on mass is one of the five modules, on length, area, volume and capacity, mass, and temperature, developed, for the use of teachers and teacher-trainer team leaders, as a product from the Project "Metric Education: We Are Getting Ready For The Change."

Parts of this module were developed and tried during the recent workshops conducted for the BOCES level team leaders. Participants of these workshops made a significant contribution in the development of this module.

The activities incorporated in this module are only suggestive in nature and teachers are free to modify them according to their classroom needs.

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December 1977

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SECTION 1

P R I M A R Y

OBJECTIVE 1: The student will be able to compare and determine whether an article is "heavier than" or "lighter than" a "standard."

MATERIALS: A weight--i.e., one kg mass piece, various articles some heavier and some lighter than a kg.

ACTIVITY: Students take turns lifting the kg weight and then one other article. Is the article heavier than the kilogram mass piece? Is it lighter? This could be done with a number of items so that students thoroughly understand the terms.

* * * *

OBJECTIVE 2: Using a balance scale, the student will be able to identify which of two objects has a greater mass (weight).

MATERIALS: Balance scale, various items--books, pieces of fruit, paper clips, coins, pencils, clay, wooden blocks, etc.

ACTIVITIES: Take two items of roughly the same weight and try to determine which is heavier. Use the balance scale to verify your answer. Repeat this procedure with various articles; for example:

- several different types of fruit
- various books
- different amounts of paper clips, bottle caps, pennies, clay, pencils, keys, jewelry, sticks, etc.
- different sizes of wooden blocks
- pets, if available

* * * *

OBJECTIVE 3: Student will be able to measure the mass of a given body using non-standard units.

MATERIALS: Balance scale, various items, some heavy and some light.

ACTIVITIES: Select one item--i.e., a block, as a standard. About how many pencils will it take to equal the mass of this block. Use the balance scale for this activity.

The same item should be used as the "standard" for serveral activities. Then a new "standard" may be used.

OBJECTIVE 4: The student will be able to measure his own weight in kilograms, and be able to record his weight in kilograms.

MATERIALS: Metric bathroom scale, 1 kg mass pieces or items with a mass of approximately 1 kg.

ACTIVITIES: Provide ample opportunities for students to feel and lift kg mass pieces so that they begin to develop a feeling for a kilogram. The student could then measure his mass on the metric bathroom scale. This measure could then be recorded on a chart in the classroom.

* * * *

OBJECTIVE 5: The student will be able to identify grams and kilograms as measures used for mass.

MATERIALS: Balance scale, metric bath scale, mass pieces, various objects.

ACTIVITIES: With the various objects (blocks, coins, etc.) and the other students determine what unit would be used to measure each. Then using the balance scale and/or bath scale measure and record the mass (weight) of each.

* * * *

OBJECTIVE 6: The student will be able to rank objects according to their mass not their size.

MATERIALS: Balance, mass pieces, assortment of objects such as a lead fish sinker, a nut, rubber ball, etc.

ACTIVITY: Look at the collected objects and in your mind arrange them in a row from the lightest to the heaviest without touching them.

Rearrange the objects after lifting them with your hands.

Rearrange them after comparing them on the balance. Examples:

- Arrange various objectives (a paper clip, a book, a clothespin, a wooden block, etc.) on a tray. Have the child arrange objects in order from heaviest to lightest. Check the estimates using a metric pan balance scale.
- Fill a paper bag with objects of various weights (a button, a hunk of clay, a ruler, a key, a shoe, etc.) Have the child arrange the objects according to their mass. Check estimates.
- Ask the child to take 5 objects from his desk. He should arrange the objects in order according to their mass. Check estimates.

- Bring various cans of juice, fruit, or vegetables. The child should arrange the cans according to their mass. Check estimates.

- Have the child arrange various size balls, books, marbles, candy bars, rocks, etc. in order according to their mass and use the scales to check his estimates.

OBJECTIVE 7: The student will demonstrate the ability to use a balance scale.

MATERIALS: Balance scale, centicubes or mass pieces, various small objects such as beans, nickels, pennies, dimes, assorted centimeter rods, paper clips, chalk, thumbtacks, pins, etc.

ACTIVITIES: Select a group of ten centicubes or a 10 g mass piece. With this on one side of the scale, complete the following statements:

It takes _____ beans to balance ten centicubes.

It takes _____ pins to balance ten centicubes.

It takes _____ paper clips to balance ten centicubes, etc.

* * * *

OBJECTIVE 8: The student will be able to recognize and write the word and symbol for the gram.

MATERIALS: Balance Scale, various small objects such as beans, nickels, dimes, pennies, etc.

ACTIVITIES: The teacher shows a gram as the standard unit for measuring mass. Have the child feel the mass of the gram, compare with a nickel, dime, penny, etc. How many grams it takes to balance a penny? etc.....

The teacher shows the child the symbol g for gram.

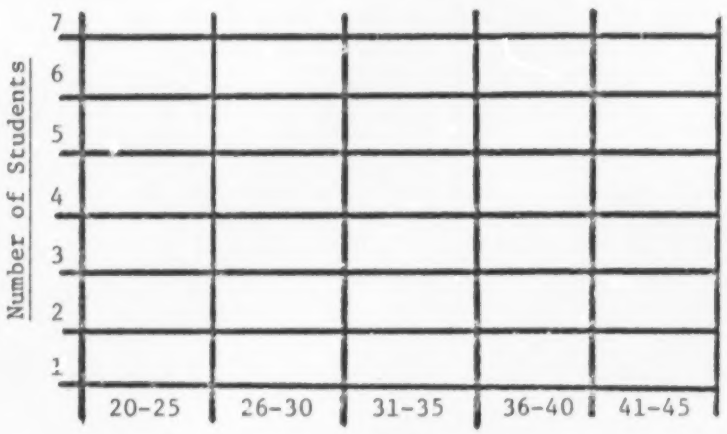
SECTION 2

INTERMEDIATE

OBJECTIVE 1: The students will be able to determine the mass of each class member and illustrate the tabulation of these measurements on a graph.

MATERIALS: Metric kilogram scale, graph paper.

ACTIVITY: Students determine their mass by using the metric kilogram scale. Each student then records his or her mass on a graph such as:



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OBJECTIVE 2: The student will be able to measure the mass of objects in grams using a balance scale.

MATERIALS: Balance scale, mass pieces, clay, various objects

ACTIVITIES: Find and record the mass of such objects as books, shoes, rocks, bags of sand, etc. Have the child find something in the classroom, gym or outside which weighs 1 kg, 5 kg, etc. Weigh the objects and record the actual weight.

If you have pets in the room, measure and record the mass of each.

* * * * *

OBJECTIVE 3: The student will be able to measure the mass of objects in kilograms.

MATERIALS: Balance scale, metric bath scale, various objects.

ACTIVITIES: Find and record the mass of such objects as books, shoes, rocks, bags of sand, etc. Have the child find something in the classroom, gym or outside which weighs 1 kg, 5 kg, etc. Weigh the objects and record the actual weight.

If you have pets in the room, measure and record the mass of each.

* * * * *

OBJECTIVE 4: The student will be able to state the relationship between a kilogram and gram.

MATERIALS: Balance scale, 1 gram cubes, 1 kg unit.

ACTIVITIES: Using the 1 g cubes and the 1 kg mass piece, count out how many grams equal one kilogram.

Since a paper clip weighs approximately one gram, have the child find out how many paper clips equal 1 kg. Compare with the answer obtained in the first activity.

Have the student design a poster advertising 1000 g = 1 kg.

* * * *

OBJECTIVE 5: The student will be able to estimate and measure the mass of a given object in kilograms and/or grams.

MATERIALS: Balance scale

ACTIVITY: Estimate and record the mass (weight) of the following objects, then measure and record their actual mass. Use the most appropriate unit.

- large piece of clay
- shoe
- dictionary
- brick
- large can of juice
- bag of sand
- quart of milk

OBJECTIVE 6: The student will be able to accurately measure mass.

MATERIALS: Balance Scale, mass pieces, popcorn and popper.

ACTIVITY: Carefully weigh out approximately 50 g of unpopped corn. Record the mass. Pop the corn and record the mass of the popped corn. Is there a difference? Why? Eat the corn.

* * * *

OBJECTIVE 7: The student will be able to find the mass of objects accurately and calculate using metric measures.

MATERIALS: Balance, mass pieces, several quarters, dimes, nickels and pennies.

ACTIVITY: Find and record the mass of a dollar's worth of quarters, dimes, nickels and pennies

If you were to buy coins by mass, which coin would be the best buy.

Have students find a combination of small coins that would balance larger coins.

Have students find as many combinations of coins as possible that total 50¢. Determine the mass of each combination.

* * * *

OBJECTIVE 8: The student will be able to correctly place the decimal point so the measurement makes sense.

MATERIALS: Worksheet

ACTIVITY: Place the decimal point in the measurement so that the measurement is logical and is one that normally can be found. In some instances zeros will need to be added.

a) A sack of grain = 5000 kg

b) A beef roast = 2000 kg

c) An aspirin table = 100 g

d) A head of cabbage = 6 g

e) A truckload of hay = 2000 t

f) A newborn baby = 20 kg

g) A whale = 60 000 t

h) A box of cereal = 45 g

OBJECTIVE 8: (continued)

i) An elephant = 4 t

j) A man = 8000 kg

k) A gold nugget = 4000 g

l) A station wagon = 200 t

m) Salt in a cake recipe = 20 kg

n) Meat in a hamburger = 200 kg

Students may make up similar problems.